

A 'tell all' about AquaTill – SRA has commissioned a demo unit

■ By Greg Butler, Research and Development Manager, SA No-Till Farmers Association

WHEN liquid is pressurised to 3450 Bar (50,000 psi) and fed through a nozzle only 0.3mm in diameter, the resulting jet stream blasts out at nearly three times the speed of sound.

The powerful liquid stream makes a formidable cutting tool and ultra-high-pressure technology developed by Flow International started to supersede traditional cutting blades in many industrial applications in the late 1970s.

For decades, farmers have been trying to manage crop residue on top of the soil using metal discs and coulters with varying degrees of success.

If other industries that cut everything from tissue to titanium can improve their performance or reduce their cost by using water-jet, why can't farmers? We cut stuff too.

Metal coulters do a great job in variety of conditions. But when heavy residue gets moist, and the soil is soft or sticky, metal coulters do reach a point where they fail regardless of disc size, downforce or groundspeed.

Perpetual problems with traditional metal coulters such as penetration and hair-pinning inspired the South Australian No-Till Farmers Association (SANTFA) to seek out the world's leading water-jet provider nearly a decade ago.

Since then, Flow International have refined the tools that SANTFA has used to develop AquaTill – a farming system where residue in any condition is managed without disturbance by employing the razor-sharp cutting capacity of ultra-high-pressure liquid.

SANTFA trials initially showed modest cutting capacity of plant residue, but the performance of the Liquid Coulters was vastly improved over several years by mounting the Flow nozzles onto engagement tools; consisting of a wheel or a ski to provide compression to the residue during the water-jet cutting process.

Extensive independent testing to evaluate the effects of cereal residue compression and travel speed was completed by the Agricultural Machine Research and Design Centre at the University of South Australia with funding from the Grains RDC (Figure 1).

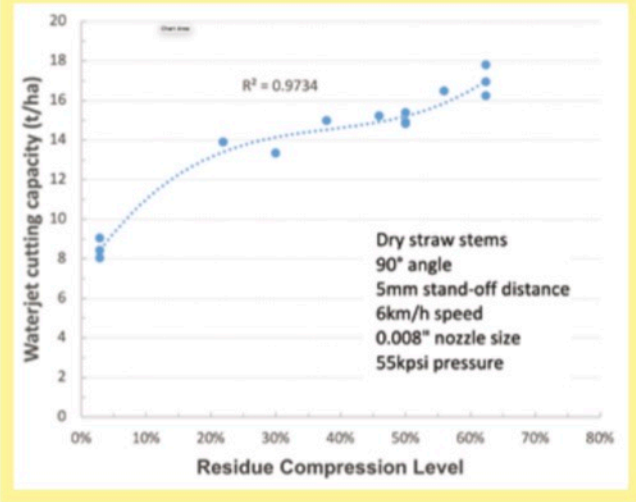
Dr Jack Desbiolles reported, "AquaTill demonstrated a high potential for crop residue cutting and is confirmed to be a great technology fit for assisting residue handling, particularly in wet stubble and soft soil environments where traditional mechanical coulters fail".

James Ogden-Brown, a progressive regional co-ordinator in the adoption group at Sugar Research Australia (SRA) made contact to determine if AquaTill methods could help sugarcane growers.



Ultra-high-pressure liquid deployed through a ski can be used as a clean cutting coulters in a process known as AquaTill.

FIGURE 1: Compressing the residue significantly increases the cutting efficiency of AquaTill



There was a high degree of confidence that the technology would assist sugarcane growers based on SANTFA's prior work with various cereal residues and James travelled to South Australia to quantify the cutting potential.

There's no doubt the AquaTill enabling technology is a potential solution for land managers that put a high priority on a healthy soil that is protected under a deluxe blanket of residue.

The preliminary sugarcane modelling suggests that the important factors for adoption are in the ball park.

Preliminary assessment using the CSIRO ADOPT model – designed to forecast the adoptability of agriculture technology – suggests that AquaTill may achieve nearly 60 per cent adoption across the sugarcane industry with in the next 20 years; which is actually quite a significant impact.

But more detailed data is required to accurately quantify the variables in a range of sugarcane applications.

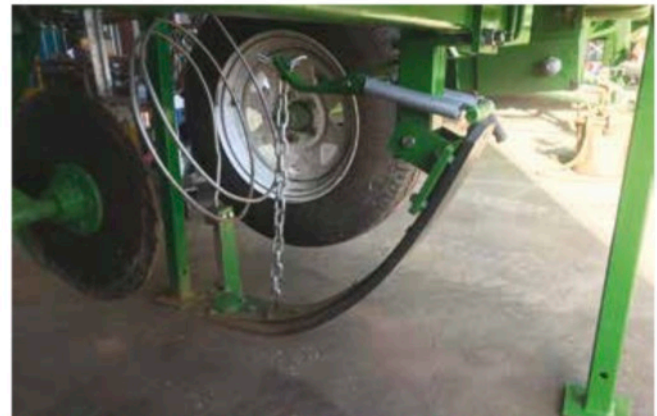
To that end, a Flow pump especially configured for sugarcane trials was supplied by Performance Waterjet (Flow agent in Australia) and integrated into a paddock ready framework by Seabrook Seeders at Coalstoun Lakes .



A torque clutch is a very safe way manage the interface between the tractor PTO and the Flow ultra-high-pressure pump.



Seabrook Seeders integrated a Flow ultra-high-pressure pump into a 2 Nozzle AquaTill trial machine especially designed for sugarcane experiments.



The liquid coulters is mounted on a ski that can regulate compression applied to the residue during the cutting process.



Australian Government

National Landcare Program





The possibilities of maintaining a thick blanket of residue and still being able to readily access the soil all year round is potentially transformational for operations and stewardship in the sugarcane industry.

AquaTill allows the targeting of insecticide directly into the soil below the GCTB; improving efficacy and reducing the potential for off-target damage.
 Second, to use the Liquid Coulter when seeding break crops in situations where growers want to retain the GCTB over

the paddock to improve soil health, water-use-efficiency and virtually eliminate the erosion of fine silt from the paddock.
 A good turnout of cane growers attended the first public demonstration of the new SRA AquaTill demonstration unit when it was conducted on December 4, 2019.



When the tool is off the ground, people are often surprised at how powerful the supersonic Liquid Coulter actually is at 50,000 psi, but when the nozzle is in the operating position right on top of the residue, the noise and blast is significantly dampened to an agreeable level.

AquaTill cuts without disturbance and it can be difficult to see the result on first inspection, but by pulling the residue aside, the cutting capacity is clear.

The current flow pump capacity is well suited to running sugarcane applications of two to eight nozzles. Seemingly, that should scale well with existing sugarcane machinery such as insecticide applicators and break crop planters.

In other AquaTill systems designed for cotton and summer cropping, a smaller nozzle may be used and a corresponding machine capacity of 12–16 nozzles is likely to be more common. A 12 row AquaTill farming system is current in the early stages of adoption on a mixed cotton and grain farm near Dalby.

For more information:
 Greg Butler, R&D Manager, SA No-Till Farmers Association.
 E: greg@santfa.com.au M: 0427 424 278 @GregoryButler71
[@sanotill](http://www.santfa.com.au)
 Hannah Russell, Graduate Adoption Officer, Sugar Research Australia.
 E: HRussell@sugarresearch.com.au M: 0436 924 713
Commercial resources:
www.aquatill.com
www.performancewaterjet.com.au
www.seabrookseeders.com.au



Growers were pleasantly surprised at the performance of AquaTill as a residue management tool at the first public sugarcane field demonstration in December 2019.

